AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior listings of claims in this application.

Claims 1-51 (Canceled).

52. (New) A catalytic composition for upgrading high molecular weight hydrocarbons comprising an admixture of water and the reaction products of particles of the following components: silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt, wherein the particles have a particle size of 3000 Blaine or finer.

53. (New) A composition for the upgrading of a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising the catalytic composition of claim 52 and a C_5 to C_{25} alkane or cycloalkane.

54. (New) A composition of claim 53, wherein the weight percents of the components are as follows:

i. about 15 to 35 weight percent silicon dioxide,
ii. about 1 to 6 weight percent aluminum oxide,
iii. about 5 to 20 weight percent ferric oxide,
iv. about 10 to 30 weight percent calcium oxide,
v. at least about 2 weight percent titanium dioxide or boron oxide, and
vi. at least about 8 weight percent transition metal salt,

the weight percents being based on the total weight of components (i) - (vi), and the composition comprises up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the composition.

55. (New) The composition of claim 53, wherein the C_5 to C_{25} alkane or cycloalkane is diesel fuel or naphtha.

56. (New) The catalytic composition of claim 52, wherein the transition metal salt is one or more of the compounds selected from ferric halides, cupric halides, cobalt halides, and ferrous halides.

57. (New) An admixture of a high molecular weight hydrocarbon and the catalytic composition of claim 52 wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

58. (New) The admixture of claim 57 wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

59. (New) A catalytic composition comprising an admixture of water and the reaction products of particles of a cement component, a volcanic ash component, a transition metal salt, and titanium dioxide or boron oxide, wherein the particles have a particle size of 3000 Blaine or finer.

60. (New) A composition for the upgrading of a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising the catalytic composition of claim 59 and a C_5 to C_{25} alkane or cycloalkane.

61. (New) The composition of claim 60, wherein the weight percents of the components are as follows:

i. 30 to 50 weight percent cement component,

ii. 30 to 50 weight percent volcanic ash component,

iii. at least 2 weight percent titanium dioxide or boron oxide, and

iv. at least 8 weight percent transition metal salt,

the weight percents being based on the total weight of components (i) - (iv), and the composition comprises up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the composition.

62. (New) The composition of claim 60, wherein the C_5 to C_{25} alkane or cycloalkane is diesel fuel or naphtha.

63. (New) The catalytic composition of claim 59, wherein the cement component is Portland cement.

64. (New) The catalytic composition of claim 59, wherein the volcanic ash component is one or more components selected from scoria, basalt, pyroclastic rock, tuff, tuffstone, volcanic glass, pumice, mafic rock, ultramafic rock, and silicate-based zeolites.

65. (New) The catalytic composition of claim 59, wherein the transition metal salt is one or more of the compounds selected from ferric halides, cupric halides, cobalt halides, and ferrous halides.

66. (New) The catalytic composition of claim 59, wherein the volcanic ash component is scoria or a mixture of scoria and basalt; the transition metal salt is ferric chloride and the catalytic composition comprises at least 2 weight percent of titanium dioxide.

67. (New) An admixture of a high molecular weight hydrocarbon and the catalytic composition of claim 59, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

68. (New) The admixture of claim 67, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

69. (New) A method of making a catalytic composition for the upgrading of a high molecular weight hydrocarbon composition which comprises:

(a) admixing particles having a particle size of 3000 Blaine or finer of silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt; and

(b) blending the admixture with water.

70. (New) The method of claim 69, wherein the weight percents of the components are as follows:

i. about 15 to 35 weight percent silicon dioxide,

ii. about 1 to 6 weight percent aluminum oxide,

iii. about 5 to 20 weight percent ferric oxide,

iv. about 10 to 30 weight percent calcium oxide,

v. at least about 2 weight percent titanium dioxide or boron oxide, and

vi. at least about 8 weight percent transition metal salt,

the weight percents being based on the total weight of components (i) - (vi).

71. (New) The method of claim 69, wherein the transition metal salt is one or more of the compounds selected from ferric halides, cupric halides, cobalt halides, and ferrous halides.

72. (New) The method of claim 69, wherein steps (a) and (b) are carried out at ambient temperature and pressure.

73. (New) The method of claim 69, further including blending the admixture with a C_5 to C_{25} alkane or cycloalkane.

74. (New) The method of claim 73, wherein the admixture is blended with up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the admixture and the C_5 to C_{25} alkane or cycloalkane.

75. (New) The method of claim 73, wherein the C_5 to C_{25} alkane or cycloalkane is diesel fuel or naphtha.

76. (New) A method of making a catalytic composition for the upgrading of a high molecular weight hydrocarbon composition which comprises:

(a) admixing particles having a particle size of 3000 Blaine or finer of a cement component, a volcanic ash component, a transition metal salt, and titanium dioxide or boron oxide; and

(b) blending the admixture with water.

77. (New) The method of claim 76, wherein the weight percents of the components are as follows:

i. about 30 to 50 weight percent cement component,

ii. about 30 to 50 weight percent volcanic ash component,

iii. at least about 2 weight percent titanium dioxide or boron oxide, and

iv. at least about 8 weight percent transition metal salt,

the weight percents being based on the total weight of components (i) - (iv).

78. (New) The method of claim 76, wherein the cement component is Portland cement.

79. (New) The method of claim 76, wherein the volcanic ash component is one or more components selected from scoria, basalt, pyroclastic rock, tuff, tuffstone, volcanic glass, pumice, mafic rock, ultramafic rock, and silicate-based zeolites.

80. (New) The method of claim 76, wherein the transition metal salt is one or more of the compounds selected from ferric halides, cupric halides, cobalt halides, and ferrous halides.

81. (New) The method of claim 76, wherein steps (a) and (b) are carried out at ambient temperature and pressure.

82. (New) The method of claim 76, further including blending the admixture with a C_5 to C_{25} alkane or cycloalkane.

83. (New) The method of claim 82, wherein the C_5 to C_{25} alkane or cycloalkane is diesel fuel or naphtha.

84. (New) The method of claim 82, wherein the admixture is blended with up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the admixture and the C_5 to C_{25} alkane or cycloalkane.

85. (New) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting the catalytic composition of claim 52 with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

86. (New) The method of claim 85, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

87. (New) The method of claim 85, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

88. (New) The method of claim 85, wherein step (a) is carried out at ambient temperature and pressure.

89. (New) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting the composition of claim 54 with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

90. (New) The method of claim 89, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

91. (New) The method of claim 89, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

92. (New) The method of claim 89, wherein step (a) is carried out at ambient temperature and pressure.

93. (New) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting the catalytic composition of claim 59 with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

94. (New) The method of claim 93, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

95. (New) The method of claim 93, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

96. (New) The method of claim 93, wherein step (a) is carried out at ambient temperature and pressure.

97. (New) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting the composition of claim 61 with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

98. (New) The method of claim 97, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

99. (New) The method of claim 97, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

100. (New) The method of claim 97, wherein step (a) is carried out at ambient temperature and pressure.